REMARKS

Claims 1-4 are presently pending in the application.

At the outset, Applicants note that on the cover page of the Office Action, the Examiner states that the certified copy of the priority document has not been received from the International Bureau. However, a certified copy of the priority document, JP 2000-173137, was filed directly with the Patent Office on March 13, 2002 and received on March 21, 2002, as evidenced by a stamped return receipt postcard. A copy of the stamped postcard is enclosed for the Examiner's convenience. Acknowledgement of the priority documents is respectfully requested. Additionally, an Information Disclosure Statement was filed with the application on February 6, 2002, but an initialed copy has not been returned. Consideration of the references cited therein and return of an initialed IDS are respectfully requested.

The Examiner has rejected claims 1 and 3 under 35 U.S.C. § 102(e) as being anticipated by, or in the alternative, under § 103(a) as being obvious over U.S. Patent No. 6,146,789 of Horie et al. ("Horie"). Claims 2 and 4 have also been rejected under 35 U.S.C. § 103(a) as being unpatentable over Horie in view of U.S. Patent No. 4,772,291 of Shibanai et al. ("Shibanai"). Applicants respectfully traverse these rejections and the arguments in support thereof as follows, and respectfully request reconsideration and withdrawal of the rejections.

Rejections Under § 102(e) or § 103(a) Based on Horie

The Examiner argues, regarding claim 1, that Horie teaches an electrochemical cell having a positive electrode, a negative electrode, a separator, an electrolyte, and a metallic case. A sealing body allegedly seals the lower opening of the cell case and a sealant [24] is between a metal case [21] and the sealing body [23]. The Examiner contends that the polymeric sealant has elastomeric properties because Horie specifically teaches that it has applicability as a sealing gasket. The sealant allegedly contains an organic pigment such as cyanine. Regarding claim 3, Figure 3 of Horie allegedly shows a gasket or "sealing member made of a synthetic resin" between an outer metal case and a sealing body. The Examiner argues that the sealing body seals an opening of the metal case, such as its lower opening, since it extends laterally across the lower battery opening, and that an upper "opening portion" is likewise sealed by bending the outer can inwardly against the positive electrode terminal. As shown in Figure 3, the sealant

[34'] is allegedly between the gasket [33] and the sealing body [31].

As to the sealant having a color different from the color of the metal case and the sealing body, the Examiner argues that it is reasonably presumed that the sealant, having a specific absorption band in the visible light spectrum, would inherently have a distinct color from the metal case and the sealing body, absent a showing that the claimed invention distinguishes over the reference. Applicants respectfully traverse this rejection as follows.

The present invention is directed to an electrochemical element having a structure which is capable of simultaneously confirming the applied position and uniformity of the thickness of sealant film applied to the case, sealing plate, and gasket of the electrochemical element by visual observation or image recognition without adversely affecting the characteristics of the sealant.

Previously, sealants were colorless, but Applicants have discovered that by utilizing a sealant composed mainly of an elastomer colored by an organic pigment with a color different from the metal case and the sealing body (and preferably from the gasket), it is possible to evaluate and judge the applied state of a sealant film based on the difference in saturation or color tone between the sealant and respective components. This makes reduction of the variation of the applied sealant possible, as well as minimizing unevenness of the thickness of the sealant and reducing the amount of sealant which is applied to only that which is necessary and sufficient to ensure sealing of the element. Therefore, sealant can be applied in uniform thickness to a predetermined position, such as the peripheral portion of the sealing body, and can prevent leakage of the electrolyte due to variation in the applied position and film thickness of the sealant.

The sealant according to the invention is colored by an organic pigment which has chemical affinity for the elastomer which forms the main component, and has a specific gravity which is substantially the same as that of the elastomer. Therefore, the pigment particles are evenly dispersed in the sealant, and no precipitation or separation of the pigment occurs (and thus no deterioration of the sealant). Since both the elastomer and the organic pigment have excellent heat resistance, and because adhesion between the sealant and other components are excellent, sealing performance can be maintained, even against excessive temperature changes and thermal stress. It is thus possible to obtain an electrochemical element with a reduced probability of electrolyte leakage.

In contrast with the present invention, Horie teaches a battery in which a visible light or

near-infrared light curing resin is used for providing a coating to insulate a gap between a positive and a negative electrode or between an end face and a peripheral edge portion of an opening portion of the battery case. As shown in Fig. 2 of Horie, for example, the coating 24 which the Examiner equates with the sealing portion is not situated between the metal case 21 and the gasket 23, but rather outside of the gasket, case, and negative electrode. In the present invention, the sealant is provided in a pathway of an electrolyte creeping directly out of the metal case, i.e., between the metal case and a sealing body or between a gasket and the metal case or the sealing body. In contrast, in Fig. 2 of Horie, the pathway of the electrolyte creeping directly out of the metal case lies between the gasket 23 and an inner surface of a terminal 22 or an inner surface of a case 21. The insulating coat, between a negative electrode terminal and the gasket, is not in the pathway of the electrolyte creeping out of the case, but rather positioned at an outlet of the pathway. Therefore, the coating of Horie does not function as a sealant which prevents the electrolyte from leaking out as in the present invention.

Furthermore, the object of the insulating coat of Horie is to prevent a short circuit at the terminals of the positive and negative electrodes. There is nothing in Horie to teach or suggest that the coat would function as the claimed sealant, permitting an easy check whether the sealant is properly applied on a part which cannot be directly observed from the outside of the sealed battery.

Finally, Horie teaches that an insulating coat is made of a visible-light or near-infrared light curing resin. However, Horie does not teach an organic pigment as claimed. As described in the specification in Table 1 (page 17) and from page 17, line 7 to page 19, line 7, organic pigments which may be used in the present invention include lake red, eosine lake, phthalocyanine green, green gold, phthalocyanine blue, and methyl violet lake. The resin in Horie is a compound having (a) at least one ethylenic unsaturated radical which is radical polymerizable, and (b) a light curing catalyst having an absorbing band in a visible-light or near-infrared light wavelength region which produces a radical on application of visible light or near-infrared light. Component (b) may be a variety of different light curing catalysts, including a combination of a boron compound, a cationic dye, and an azo compound, for example (col. 2, lines 50-67). Appropriate cationic dyes include cyanine, merocyanine, indoline, thiazine, etc. (col. 4, lines 4-8). However, Horie does not teach or suggest an organic pigment as claimed.

For all of these reasons, Horie does not anticipate or render obvious the present claims and reconsideration and withdrawal of the § 102(b) and § 103(a) rejections are respectfully

requested.

Rejection Under § 103(a) Based on Horie in View of Shibanai

Regarding claims 2 and 4, the Examiner argues that Horie teaches that the cyanine pigment is complexed with boron, but acknowledges that Horie does not explicitly teach a phthalocyanine-based metal complex. However, the Examiner contends that Shibani specifically demonstrates mutual equivalence between cyanine and phthalocyanine. Absent unexpected results between cyanine and phthalocyanine, the Examiner concludes that phthalocyanine would have been an obvious substitution to the artisan for reasons such as employing a suitable organic pigment based on its distinct absorption band for a particular application requiring the band in the visible light spectrum. Applicants respectfully traverse this rejection as follows.

First, Horie teaches a long list of possible dyes for use in the battery (col. 4, lines 4-8). However, Horie does not recognize that at least one of these dyes, cyanine, would not be appropriate for use in the present invention. Specifically, cyanine dyes have poor organic solvent resistance and heat resistance, and also dissolve in organic electrolytes. Therefore, cyanine dyes are not suitable for use in the claimed sealants. In contrast, phthalocyanine dyes are particularly attractive, due to their strong colors, high stability (organic solvent resistance, alkali resistance, and acid resistance with respect to various types of electrolytes such as organic solvents), specific gravity similar to the elastomers used in the sealants, and superior heat resistance.

Shibanai teaches a method of using dyes for preparing densely colored pellets for synthetic resins by converting the dyes to the corresponding clathrate compounds. Dyes which may be used include, among 24 others, cyanine dye and phthalocyanine dye. However, since these dyes are used for a completely different application and not with an elastomer or organic electrolyte, one skilled in the art of the present invention would not look to Shibanai for alternative dyes. Furthermore, the Examiner contends that cyanine and phthalocyanine are equivalent and that it would be obvious for the skilled artisan to substitute one for the other. However, they are clearly not equivalent with respect to the claimed sealants, since cyanine is an inferior dye, with noticeable drawbacks, and phthalocyanine is a superior dye with many advantages. It would thus not be expected based on Horie (which does not recognize the drawbacks of cyanine with respect to elastomers or organic electrolytes) or Shibanai (which is from a different field of art) that superior results may be achieved by using phthalocyanine as in

the present invention. Accordingly, the present invention would not have been obvious based on the proposed combination of Horie and Shibanai, and reconsideration and withdrawal of the § 103(a) rejection are respectfully requested.

In view of the preceding Remarks, Applicants submit that the pending claims are patentably distinct from the prior art of record and in condition for allowance. A Notice of Allowance is respectfully requested.

Respectfully submitted,

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June 1, 2004
(Date)

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OF Tadayoshi Takahashi et al

FOR: Electrochemical Element

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